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## FOREWORD

The *Fire Safe Guides for Residential Development in California* have been well received and well used. However, the time has come for an update and a new title – *Structural Fire Prevention Field Guide*. New legislation, new research data, and new technology such as geographic information systems (GIS) must all be discussed in this updated guide. Much of the experience gained has validated previous fire safe guides. In addition, CDF now has a vital “Fire Plan,” and federal agencies have revised their Fire Management Policy.

The purpose of this new *Structural Fire Prevention Field Guide* is to facilitate implementation of state ordinances within the Urban-Wildland Interface in order to make structures safer. This Guide is intended for wide distribution to agency staff, to help homeowners, landowners, decision-makers, and local government planners learn more about factors important to land use decisions.

The Introduction of this updated Guide presents the difficulty of structure protection when accumulated fuels (due to successful fire suppression) make property damage more likely and firefighting harder. Increased numbers of structures in the wildland change firefighting strategies and often limit defensive options.

This Guide discusses the legal underpinnings of fire safe requirements, including laws and regulations covering general fire prevention and wildland fire safe regulations, recommended standards spanning entire fire and building codes, and spatial factors of lot development, infrastructure, and building construction. Guidelines for hands-on implementation of fire safe strategies through fire resistant landscaping or fuel modification are also included in this guide. A section on land use planning, particularly how fire safety can be incorporated into land use planning decisions at the general plan level, is an important portion of this guide. The section presents ways to assess hazards for land use planning decisions, with specific information on how to identify needs for increases in pre-fire management. Finally, the guide describes how to develop and implement a fire safe plan for large areas (i.e. less than a county, larger than a subdivision).

The appendices provide a useful bibliography, a glossary, statutes and regulations, legal opinions on fire safe issues, and fire resistant landscaping or fuel modification methods.

The California Department of Forestry and Fire Protection hopes this document will be well used to help enhance structure protection and minimize damage to California’s abundant and precious natural resources. Users should feel free to put this material to good use by copying graphics, quote regulations, etc.

**This document contains several hyperlinks to other documents and on-line sources of information about structural fire prevention and protection.**

## 1. INTRODUCTION

To protect resources, both natural and developed, public policy demanded an aggressive initial attack fire suppression strategy. This strategy resulted in the interruption of California's natural fire regime with lower frequency, shorter seasons, larger average fire size and increased intensity. The consequences of this change in the fire regime include increased fire hazards and increased continuity of fuels, including vegetation and structures, which complicate firefighting. Skyrocketing firefighting costs and unacceptable damages to natural and developed resources have resulted.

At the same time, a boom of growth in residences increased the number of ignitions in the wildlands, posing an unprecedented threat to natural resources while prompting changes in firefighting techniques and strategies. Recently a change in emphasis—from fire protection resources to pre-fire management—has been embraced by all major agencies with natural resource management and fire protection responsibilities.

The effectiveness of pre-fire management is demonstrated by house survivability studies. For example, information from wildland resource expert Ethan Foote's *Structure Survival on the 1990 Santa Barbara "Paint" Fire* indicates that homes with a noncombustible roof and vegetation clearance had a 90% chance of survival (99% when defensive actions were also taken by civilians or firefighters). These measures tend to create a defensible space so that people may defend the structure. Houses with combustible roofs, no vegetation clearance, and lack of intervention had a 4% chance of survival. Under this scenario, pre-fire management provided nearly certain survival as opposed to nearly certain destruction.

Legislators have recognized the need for and effectiveness of pre-fire management by way of various laws. These encompass hazard assessment, requirements for noncombustible roofing, and disclosure for fire hazards when selling real property.

It is now the responsibility of those who implement fire safe regulations to apply these strategies using common sense. This guide will assist in implementation and help promote positive action.

## **2. FIRE PROBLEM**

### **2.1 Analysis of the Problem**

The diagram in Appendix A outlines the complexity of issues about structure protection in the wildlands. Many factors affect each other. Intervention to minimize damage can occur in various ways. For example, better roads and/or water systems may be constructed, subdivision review and approval can require mitigation of fire hazards, or vegetation can be modified around structures. However, for an area to be fire safe, most if not all of the factors shown in Appendix A will need to be addressed.

This is a challenging task that requires knowledge of fire behavior, communication with the public and decision-makers, infrastructure, fuel modifications and their environmental impacts.

### **2.2 Special Fire Problems**

California has a disturbance-based ecosystem, meaning among other things, that a significant portion of the state burns every year. On the average, grasslands generally burn every five years, pine forests every ten years and chaparral stands every 40 years. Until the 1970's, fire suppression tended to minimize fire spread, but the 1990's have seen a trend of larger, more damaging fires.

California's forest, grass and brush land ecosystems have adapted to fire, evolving characteristics that make burning part of their survival process. For instance, ponderosa pines have resinous needles that create flammable litter, while chamise retains more and more highly aerated oil as it ages. Millions of years of evolution support California's chances of experiencing fires.

Surprisingly, the vast majority of California's residents do not fully recognize the threat of wildfires. Instead, crime, education and economy top politicians constituency's concerns, since fire does not play a significant role in every area of the state. Accepting the inevitability of fire in California's landscape could be the biggest problem facing fire prevention and protection specialists. Some opposition to fuel management rests on the assumption that fire is a natural occurrence. However, to say, "let nature take its course" may have dire consequences in this situation.

Occasionally nature deals fire safety a bad card. For example, the effects of heavy snow, bent and broken tree branches fueled the huge lightning-caused 1977 Marble Cone Fire in the Ventana wilderness in Monterey County. Broken tree branches and dense brush fields fueled rapid fire growth in the 1991 Oakland/Berkeley Tunnel Fire. Six years of drought in the 1970's, the late 1980's and early 1990's triggered insect infestations, causing trees to die in places where tree density was unnaturally high, such as in the Tahoe basin and throughout the Sierra Nevadas. Natural events such as frost, insect infestations, and blow downs will happen again. The same area affected by snowfall in 1976 was again blanketed with unseasonable snow in 1998. While these events may be short-lived, dead, flammable fuels will remain until they are removed, either by wildfires or by pre-fire management.

### **3. DEFENSIBLE SPACE**

The term “defensible space” was first coined in the 1980 *Fire Safe Guide for Residential Development in California*, and it now provides the cornerstone for the Board of Forestry's fire-safe regulations and CDF's wildland fire prevention planning program.

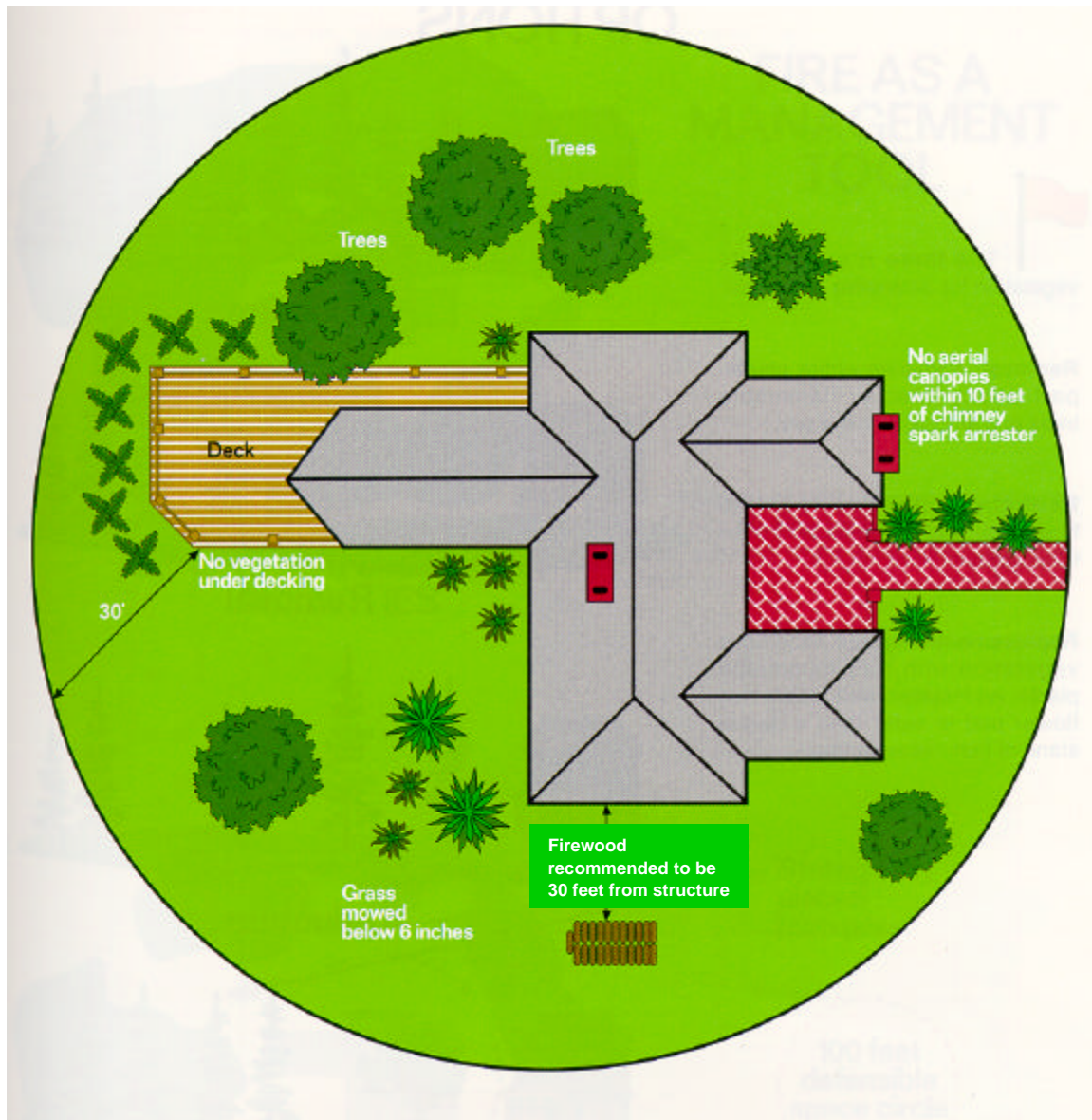
Defensible space is the area within the perimeter of a parcel, development, neighborhood or community where basic wildland fire prevention practices and measures are implemented, providing the key point of defense from an approaching wildfire, an encroaching wildfire or an escaping structure fire. The perimeter is the area of the parcel or parcels proposed for construction and/or development, excluding the physical structure itself. Properly maintained emergency vehicle access, emergency water reserves, street signs, building identification, and fuel modification should characterize the perimeter area. CDF can provide guidance to local jurisdictions, agencies, professionals and the public in implementing these measures.



**Photograph 3.1.**  
**Lack of Defensible Space**

The design and construction of structures, subdivisions and developments in State Responsibility Areas (SRA), as well as in Local Responsibility Areas (LRA), must provide for defensible space, including built-in wildland fire prevention as prescribed by local jurisdictions and fire agencies. The employment of defensible space is just one step in mitigating wildland fire losses. The primary key of this concept is built-in fire prevention. Each home built in the wildlands must provide some basic level of self-protection, including water, adequate roads, flammable vegetation clearance and proper building identification. Each resident and developer must accept part of the responsibility for incorporating basic perimeter fire prevention measures into the design and construction of wildland structures and developments. This incorporation of defensible space provides a margin of safety for wildland and structural firefighters, provides a point of attack or defense, and increases the survivability of the home or development.





**Photograph 3.2.**  
**Defensible Space**

### 3.1 Maintenance of Defensible Space

Fire prevention measures are often specified during the permitting and map approval stages of development. Unfortunately, over time, these measures may not be properly maintained. A fire hydrant that does not supply water is not worth having. Regular maintenance of defensible space requirements is essential to the success of the state's wildland fire prevention mission and should be a condition of any permit or map approved by local government. Maintenance timing, whether annual or more frequent, must be considered during the planning phase.

The party responsible for maintenance must be identified before development and construction begins. It

may be the property owner, the developer, a homeowners association, a county service area or even the public jurisdiction. Agreement, bond or inclusion in a maintenance district or service area can secure maintenance.

### **3.2 The State's Responsibility**

The state of California has retained the responsibility for wildland fire prevention as a part of its mission of protecting and enhancing California's natural resources. As homes and communities have been built in the wildlands, the state has taken an active role in proposing mitigation, recommending and assisting in preparing strategic plans and providing effective fire prevention and loss reduction programs and activities. The Fire Safe program was developed in 1963 to address this growing conflict between homes and wildfire. Its goals are to:

- Develop uniform statewide minimum standards for wildland fire prevention.
- Reduce loss and damage to structures and resources.
- Create a safer environment for occupants living in the wildlands who are at risk from wildfires.
- Require self-protection, with less dependence on state and local fire agencies.
- Provide defensible space for firefighters, reducing firefighter risk.
- Reduce the vulnerability of homes and developments to wildfire.
- Support CDF's resource protection mission.

### **3.3 Local Government's Responsibility**

Local government is granted the authority to provide life and property fire protection and to approve local construction and development. Local government therefore has the responsibility to develop prudent and appropriate land use goals, and to implement them through general plan policies, zoning and land use controls. The implementation process is the approval and issuance of permits and maps. To fulfill this role of land use authority, local government must look beyond its interpreted statutory role and accept its responsibility for life, property, safety and natural resources. When growth is allowed to continue in rural areas, local government must ensure that the growth is responsible, limiting risks to an acceptable level. This requires an active response! Demonstration gardens and examples of Fire Safe development and construction must be recognized and shared with those who need to learn. Local government can promote public awareness by demonstrating leadership and appropriate responses to the Urban-Wildland Interface problem.

In response to major wildfire conflagrations in the LRA, the Legislature established fire safe requirements for these areas to balance local fire prevention with that of the SRA. These effort, which are most widely known as the "Bates" and "Brown" bills (AB 337 and 3819), were signed into law in 1992 and 1994 respectively, and are now in effect. As required by the Bates bill, CDF in cooperation with local fire authorities identified Very High Fire Hazard Severity Zones (VHFHSZ) in LRA. In accordance with this statute, the original zone identifications were transmitted to local authorities, and the State Fire Marshal (SFM) developed a model ordinance for zone adoption. Local authorities had the option of adopting the ordinance or indicating their fire safe regulations already "met or exceeded" those fire safe standards included in the Bates bill. In accordance with the Brown bill, the SFM drafted another model ordinance in 1996, including more stringent fire safe standards. The history of these laws and the model ordinances are available on the Internet at <http://www.prefire.ucfpl.ucop.edu/izhazard.htm>, as part of the *Wildland Fire Hazard Assessment* publication.

### **3.4 Public Responsibility**

Government today is overburdened and overwhelmed with its responsibilities, especially in the area of fire protection. New fire engines and more firefighters, while necessary to maintain fire protection equivalent with basic growth, are very expensive. Fire engines and firefighters do not solve the whole problem. Eight, 10, 20 or even 100 fire engines cannot protect every home threatened during a wildfire. Thus, the responsibility falls on the homeowner, developer and contractor who create the environment.

Neighborhood and community action are essential. New revenues and tax sources are not easy to find, and new approaches must be found. The residents are the keys to positive action. Groups such as homeowners' associations and Fire Safe Councils (<http://www.firesafecouncil.org>) are local catalysts that can bring the community together with decision-makers to make active progress.

Fire departments must solicit the support of local officials, citizens and advocacy groups to facilitate adoption, implementation and maintenance of fire safe standards. Public education efforts should focus on these groups. Every wildland resident and visitor must understand how to act in a fire safe manner.

### **3.5 Natural Hazard Disclosure**

Since July 1, 1991, each seller of real property in SRA has been required to disclose to any prospective purchaser that the property for sale is in a wildland area that may be subject to wildfire risks and hazards. Each seller shall also disclose that the property must meet the flammable vegetation clearance requirements of Public Resources Code (PRC) 4291. The seller must also disclose to any prospective buyer that it is not the state's responsibility to provide fire protection services to any building or structure located within the wildland unless the state has entered into an agreement with local government to provide structure fire protection.

Effective June 1, 1998 the law requires disclosure by the seller of real property of all areas subject to certain natural hazards including fire hazards. All SRA lands pursuant to PRC 4125 are included on Natural Hazard Disclosure (NHD) maps. Very High Fire Hazard Severity Zones (VHFHSZ) in LRA identified pursuant to Government Code Sections 51178 and 51179 are also on these maps. Copies of the maps showing these areas have been provided to each county planning department and to each CDF Ranger Unit. Additional copies are available through the Teale Data Center in Sacramento. More information about NHD is available on the Internet at <http://www.ceres.ca.gov/planning/nhd>.



**Photograph 3.3.**  
**Home within State Responsibility Area**

## 4. LAND USE PLANNING

*"The Legislature finds and declares that California's land is an exhaustible resource, not just a commodity, and is essential to the economy, environment, and general well-being of the people of California. It is the policy of the state and the intent of the Legislature to protect California's land resource, to insure its preservation, and use in ways which are economically, and socially desirable in an attempt to improve the quality of life in California" (Government Code, Section 65030).*

*"The Legislature also finds that decisions involving the future growth of the state, most of which are made and will continue to be made at the local level, should be guided by an effective planning process, including the local general plan, and should proceed within the framework of officially approved statewide goals and policies directed to land use, population growth and distribution, development, open space, resource preservation and utilization, air and water quality, and other related physical, social, and economic development factors" (Government Code Section 65030.1).*

These Government Code Sections are the cornerstone of land use decisions in California. Since 1963, CDF has taken an active role in the development of statewide resource protection and life safety policies, as well as influencing local general plan development and implementation. Local fire jurisdictions should become actively involved in developing, editing and implementing local land use planning laws and decisions. These are prime opportunities to implement positive wildland and structural fire prevention to benefit a community. This will help communities to 1) resolve problems before they become difficult, and 2) plan for the future.

In most jurisdictions, the responsibility and authority for regulating land use and development rests with the county or individual community. Guiding these development and land use decisions are master plans or general plans, which in many cases are legally mandated. General plans provide a master policy template to guide growth and provide the authority for other local controls such as planning and zoning laws and local ordinances. Most planning documents include: 1) a data and analysis section, where local hazards, risks and fire protection capabilities are identified, 2) a policy section, that provides broad direction to resolve a problem or implement a solution, and 3) implementation measures, such as applying a local ordinance.

### 4.1 Development Plans

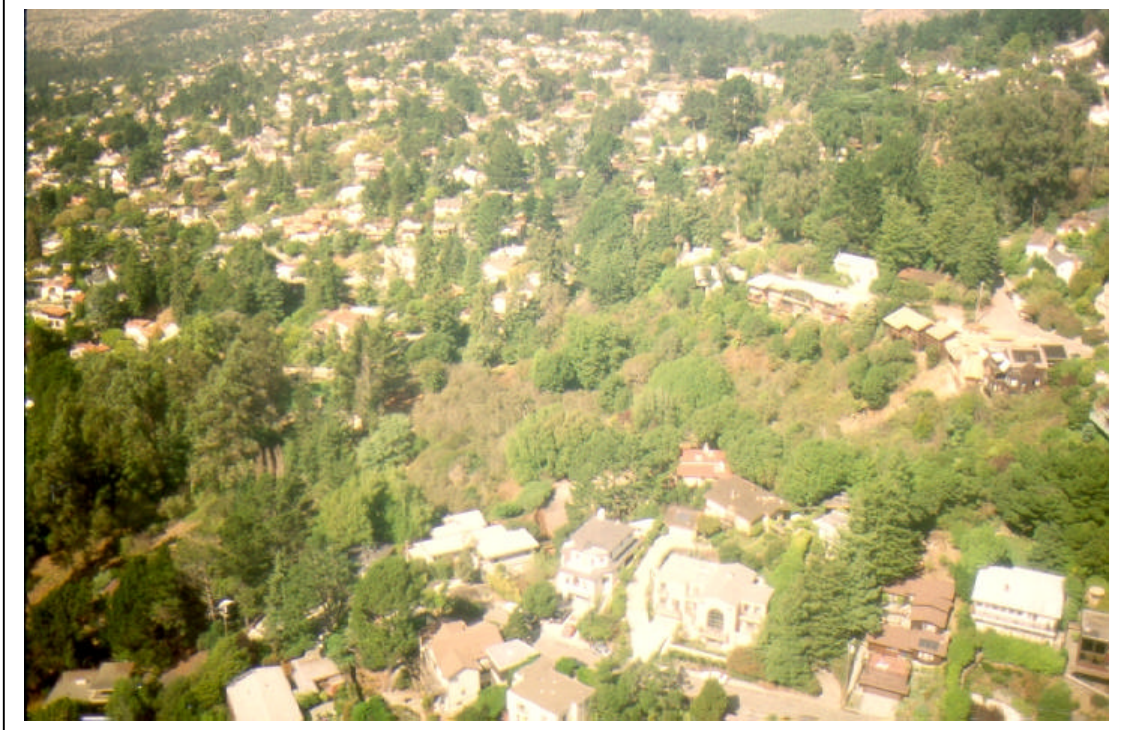
General plans and the resulting area plans, zoning ordinances and fire prevention ordinances can mitigate the impact of new housing and subdivisions on a department's ability to provide fire protection.

Results may include interior and exterior life safety measures, wildland and structural fire prevention systems, mitigation fees, maintenance prescriptions to keep the required measures operating and in place, restrictions on road design, and enhanced water supply systems.

In conjunction with the local building code, these measures can address individual parcels as well as individual residences and commercial occupancies. Where remodeling occurs, or in the case of existing structures that do not meet today's standards, it is more difficult to achieve results, but even these can be handled by a local ordinance, depending upon the political and economic mood of the community.



The key is to talk to those who make the decisions, educate them, become active in the land use process, maintain continued involvement and be reasonable to their needs. Suggested planning references include *Fuel Modification Plan Guidelines for High Fire Hazard Areas* developed by the Orange County Wildland/Urban Interface Task Force Subcommittee on Fuel Modification and the *Subdivision Map Act Manual and California Land Use and Planning Law* available through Solano Press in Point Arena.



**Photograph 4.1.**  
**Major Development within California Wildland**

Fire safe regulations are implemented via the local government building permit and subdivision map approval process. Because local government is the approval authority for development, these regulations are triggered by the application for a building permit for purposes other than limited remodeling. These include but are not limited to submittal of a subdivision map, application for a use permit, siting a mobile or manufactured home, or constructing a road.

## **4.2 County General Plans**

California law (Government Code Section 65030.1) directs that future growth decisions shall be made at the local level, guided by an effective planning process (general plan, etc.) and statewide land use goals and policies. Many opportunities for design, direction and improvement of fire and resource protection are found in the general plan.

The county general plan provides: 1) long-term plans for growth, 2) local controls over development, 3) protection of public health and safety, and 4) descriptions of community values and future expectations. The courts have defined the county general plan as the constitution for local development. It is the master document that governs land use. All land use must comply with the general plan, and the general plan must be consistent internally. The Governor's Office of Planning and Research distributes guidelines for development of county general plans, including specific directions on mandatory elements and issues, including the safety element provision for wildfire safety. Each county develops its own general plan and

elements that accordingly address local issues of growth.

#### **4.2a Fire Safe Requirements**

Government Code, Section 65302(i) requires all counties to address fire safe standards in the safety element of their general plan, specifically: evacuation routes, peak load water supplies, minimum road widths and clearances around structures. This was to be completed by 1974. Most counties did address some level of fire safe measures in their general plan. However, many did not. Even where they did address fire safe standards, the standards vary widely in content and effectiveness. On the other hand, several counties have adopted strong fire safe ordinances that require significant fire prevention measures. CDF, as the fire agency responsible for protecting SRA, believes that firefighter safety is an issue that crosses governmental boundaries and requires statewide attention. The following discussion details required and recommended activities.

Information on the county general plan, the development process and strategic fire planning can be found in [\*A Discussion of the County General Plan and the Role of Strategic Fire Protection Planning\*](#), prepared under contract for CDF on September 30, 1989. Additional information is included in these Governor's Office of Planning and Research publications: [\*Planning, Development and Zoning Laws\*](#); [\*County General Plan Guidelines\*](#), and [\*CEQA: The California Environmental Quality Act, Statutes and Guidelines\*](#). Summaries and excerpts from these documents will follow.

Six of the mandated seven elements are pertinent to the wildland fire prevention and protection mission. These are described with comments on their importance to fire and resource protection, along with some sample evaluation criteria.

#### **4.2b Land Use**

The land use element "dedicates" lands to particular purposes. It tells how the jurisdiction will designate and separate various uses such as commercial, industrial and residential. Natural resource, agriculture, timber production and flood plain areas (if any) must be included. A major intent of the element is to design developments that are compatible with one another. That is, heavy industrial areas should be separated from, and not adjacent to, residential areas. On the other hand, light commercial or shopping center designations may be compatible with residential uses. Sometimes, commercial areas are set aside as buffers or gradual-change areas between residential and industrial uses.

Examination of the land use element in conjunction with wildland areas may reveal current or future conflicts with fire and resource protection. All too frequently, the compatibility of land uses is compromised where development and wildlands meet. All types of uses might be designated in or adjacent to hazardous fire areas without buffer zones or other mitigating measures. Land use policies should consider and reduce these conflicts. Since zoning districts are derived from land use designations, it is important to assure that those designations, policies, and ordinances are compatible with wildland protection. For example, residential, open space, agriculture and timber preserve land uses could be designated to include fuel break and fuel reduction zones.

When evaluating a land use element, one should consider the following questions:

- Does the land use element include wildland fire risks and hazards in the data and analysis section?
- Do policies include reduction of hazard levels by various methods?
- Are recreation areas (parks, golf courses) and agricultural uses (pastures, irrigated tree farms) located to provide buffers between development and wildlands?

#### **4.2c Housing**

The housing element determines how the government will regulate density and intensity of residential development. It includes provisions for low income and handicapped needs. In some cases, it may actually allow lower standards of design and construction to encourage affordable housing. In hazardous areas, this element could conflict with fire safe development. Access, construction standards and design requirements may be reduced by the jurisdiction in an effort to provide affordable housing. Alternatively, safer areas should be designated for this type of development.

When evaluating a housing element, one should consider the following questions:

- Does the data and analysis section describe vulnerable, unsafe areas for "sub-standard" housing?
- Do the policies recognize those areas and prohibit this type of development there?
- Are construction standards in accord with defined fire prevention needs (access, roofing, fire flow)?
- If not, what compensating mitigation measures are required to provide safety?

#### **4.2d Circulation**

The circulation element delineates the general location of existing and planned transportation routes and public utilities. Designations, policies and implementation measures in this element (and all others) must be consistent with the land use element. The information is usually shown on maps or diagrams to show how the transportation system serves the various land use designations. This element is the primary guide for access routes and road design requirements (not engineering standards). Government Code Section 14000 requires that the circulation element provide transportation facilities that reduce hazards to human life and minimize damage to natural resources. This provides the opportunity to make strong recommendations about transportation routes and design requirements such as turnouts, helispots and safety zones.

When evaluating a circulation element, the following questions should be considered:

- Does the element plan for satisfactory access to high hazard areas?
- Are standards high enough to provide safe evacuation from residential (and other) land use areas?
- Are policies defined to limit the number and length of one-way roads?
- Are heliports and helispots designated in areas to facilitate suppression and other emergency needs?

#### **4.2e Conservation**

The conservation element describes how the jurisdiction intends to protect and conserve its natural resources. It should discuss water, soils, forests, wildlife and fisheries. Potential fire and flood impacts on all resources should be included. This element ties directly to the life, property and wildland fire prevention and protection mission. It should be written to support that mission. As with all other elements, this one must be consistent with the general plan. It must explain natural resource management policies in a way that makes sense alongside other land use policies. In some counties, urban bias shows itself quite clearly in this element, when only local wastelands, rocky ridges, and impassable canyons are included in the conservation element. This is not the intent of the Legislature nor planning and zoning laws.

When evaluating a conservation element, consider the following questions:

- Is the element consistent and logically applied, or does it just gather up unusable areas and "lump" them into a conservation category?
- Does the element discuss resource values?



- Are potential resource losses from fire (soil loss, sedimentation, local flooding, timber production, wildlife habitat, etc.) included in the data and analysis section?
- Do policies include management options of prescribed fire and fuel breaks to enhance protection?

#### **4.2f Open Space**

The open space element designates areas for preservation and managed production of natural resources, outdoor recreation, and public health and safety. The open space element is related to the conservation element in some ways, and designated lands in either element could be actually or nearly the same. The important difference between conservation and open space elements is the very specific inclusion of public health and safety requirements in open space. Government Code Sections 66560-66564 dictate that this element should include designation of "areas that require special management because of fire risks." These sections of the Government Code authorize the connecting or linking of these areas into complete networks in the interest of public safety. The open space element offers an opportunity to analyze conflagration potential and to design fuel break and fuel reduction zones, helispots, access and water systems into strategic fire defense improvement systems. Developers can be required to construct and maintain these improvements. Inclusion of strategic defense improvements in the open space and safety elements will lead to zoning for such improvements and eliminate the owner-by-owner agreements and public agency financing now necessary for construction and maintenance.

When evaluating an Open Space element, one should consider the following questions:

- Does the element relate to fire safety and suppression effectiveness?
- Is it consistent with the land use, safety and conservation elements to provide integrated and systematic resource and public protection improvements?
- Does it contain policies and implementation measures requiring dedication, construction and/or maintenance of these improvements on all projects?

#### **4.2g Safety**

The safety element defines community protection in relation to fire, seismic and geological hazards. It must include provisions for evacuation routes, water supply, minimum road widths and clearances around structures. It should include mapping of fire hazard severity zones and could include analyses of minimum suppression resources required. The safety element can be used to strengthen or further justify other elements. It is an excellent place to include project design requirements for reducing hazard levels and to provide for mitigation measures not included elsewhere in the general plan. It may also be used to justify zoning for strategic fire defense systems.

When evaluating a safety element, the following questions should be considered:

- Does the element correlate with others to provide for the best and safest suppression actions? Does it recognize evacuation needs?
- Does it address the traditional suppression problems and include policies and implementation measures to eliminate those problems?

During 1989, the Legislature applied some effective "band-aids" to the Urban-Wildland Interface problem. Per Senate Bill 186, each county is now required to submit any revisions of their General Plan safety element to the California Board of Forestry for review and comment. If the county fails to implement the Board's comments, they must state why. CDF staff members also successfully encouraged the Governor's Office of Planning and Research (OPR) to address significant strategic wildland fire prevention and protection methods in their 1991 edition of the *General Plan Guidelines*. This document guides the

development and update of general plan elements by counties.

#### **4.3 Actions You Can Take to Improve Land Use Plans**

Again, the key is to be active in the land use planning process. Talk to the decision-makers, educate them about fire safety issues and be reasonable about their needs.

- A. Review comprehensive land use plans prepared in advance of development. These should be prepared and reviewed as soon as fire hazard areas are considered for development. This way, problems can be resolved before the proposed development has begun. Situations hazardous to life and property resulting from lack of land use planning are often very difficult to correct. In such cases, all those concerned must acknowledge and accept the level of risk and probable damage from wildfires.
- B. Conduct fire prevention planning for large cohesive units in conjunction with planning drainage, soil erosion, flood control and sanitation. Fire prevention planning is necessary for safe development of watershed areas. Develop examples of how to apply planning to an actual problem area to illustrate the basic relationship of fire prevention to the development of mountainous, grassy and brush-covered land. Such examples or area models may encourage a mutual understanding of fire planning principles between planners, land developers, builders and regulatory agencies of government.

A good source for more information is the City of Hayward [\*Hillside Design and Urban/Wildland Guidelines\*](#).

- C. Use Fire Hazard Severity Zones to specify conditions under which the use and development of specific areas can occur. A hazard classification system can also provide a basis for detailed zoning. In addition, future use of the California Fire Economics Simulator (CFES) as part of a series of analytical programs may help identify the effects of a specific development, whether fire safe or not, to CDF's wildland fire prevention and protection mission. Encourage local government to adopt and enforce the standards specified in this guide. If circumstances warrant, develop more restrictive standards in conjunction with local jurisdictions. In SRA there are three levels of fire hazard identified. Very High is the most critical, and proposed developments in these areas need special attention. The CDF system uses weather, fuels, and topography to rate each area. In LRA, the same system has been used with structural density and points added or subtracted for other criteria. If the proposed development is adjacent to Federal Lands, the appropriate authority should be contacted to ascertain whether the Federal Lands have been rated (there currently is no common system in use by Federal agencies). For more information about hazard assessment and severity zones, refer to the *Wildland Fire Hazard Assessment* publication at <http://www.prefire.ucfpl.ucop.edu/izhazard.htm>.
- D. Review proposed lot splits, subdivisions and other developments for fire prevention and protection needs in conjunction with water, road, health and flood control authorities. Make planning recommendations for large-scale housing or planned-unit developments, not just for traditional subdivisions. Review new development, appropriate variances and use permits to assure an acceptable level of fire safety. Also review changes in zoning related to land use and development density, as well as area and specific plans or other long and short-range plans.

- E. Recognize and confer with the fire protection agency where the project is located when establishing conditions for use or development of an area. Local fire protection agencies, along with local planners, can recommend a comprehensive land use system which recognizes special fire problems and requirements related to vegetation, topography, weather, transportation systems, water supply systems, building density, hazard reduction and risk. The overriding concern in developing recommendations is to emphasize the protection of life and property from wildfire and prevention of damage to adjacent watersheds and other natural resources. Be sure to consider the cost versus risk analysis and economic impact of any recommendations.



**Photograph 4.2.**  
**Special Fire Problems in Rural Areas**

- F. Require the developer to provide at least two access routes during each phase of a large development. Require the developer to provide fire prevention and protection measures throughout the entire project. Include current and projected fire protection needs, including fire facility sites, in all development plans. Require assurance bonds of performance to ensure that developers provide fire safe measures that give new residents a reasonable level of protection. The value of assurance bonds should be sufficient to compensate for increased costs due to inflated values over the duration of the development. Require developers to hire a licensed urban forester to oversee the management of vegetation during development. The urban forester can assist with planning the location of parks, golf courses, utility corridors, roads, streets and landscaping with fire prevention and protection in mind.

The functional placement of greenbelts--areas of managed vegetation kept irrigated and constantly green--can reduce the vulnerability of a development to wildfire at little cost. Include permanent greenbelts or fuel breaks in the plan, and assign the responsibility for maintaining these areas so that the benefits of such measures are guaranteed in the future.

- G. Review any division of land into two or more parcels for the purpose of lease, sale, conveyance or

transfer, whether immediate or future, which is not defined as a subdivision. This will assure that fire safe standards are applied to high fire hazard areas developed outside of major subdivisions. Counties may apply the same requirements to major and minor subdivisions, such as road and water requirements, but many choose to apply alternative strategies to “4x4s” and other parcel splits. For more information refer to the *PRC 4290 Guidebook*.

- H. Design fire prevention planning measures such as emergency access roads, emergency water storage, heliports, safety islands, fuel breaks and vegetation management as part of an overall fire defense system to facilitate fire control. Fuel management modifies the threat posed by vast areas of vegetation either by reducing the available fuel through prescribed fires, or by converting the vegetation to a type that is less hazardous. Treat all wildland adjacent to an inhabited area to reduce the conflagration hazard. Various measures can break up broad expanses of vegetation into manageable segments. Encourage wildland fire protection agencies to perform and assist landowners in such treatments. Also encourage cooperative land management planning efforts for land treatment systems, community firebreaks and facilities for the mutual defense of both the community and natural resources. Contact CDF and local fire departments for additional information and assistance.

## **5. FIRE SAFE LAND USE PLANNING BUSINESS PROCESS**

Fire safe land use planning should be developed and implemented for large cohesive units under the guidance of the general plan safety element, and in conjunction with the planning for drainage, soil erosion, flood control and sanitation. Planning for fire prevention and protection is necessary for full and safe development of watershed areas. To illustrate this planning concept and the basic relationship of fire prevention to the development of the wildland, local planning and fire authorities should develop examples of how planning could be applied to an actual problem area. Such examples, or area models, would encourage mutual understanding of fire planning principles between planners, land developers, builders and regulatory agencies. For specific information on the CDF California Fire Plan, visit the Internet site [http://frap.cdf.ca.gov/fire\\_plan/](http://frap.cdf.ca.gov/fire_plan/).

### **5.1 Elements of a Fire Safe Land Use Plan**

There are three parts to the planning process: the technical process, legal requirements and political acceptance. The technical process defines the needs for adequate protection complying with and supporting state planning laws. Meeting legal requirements is also relatively easy, if the technical work has been done correctly. The political process is the most difficult, because it depends heavily on the attitudes and perceptions of people. This chapter touches very briefly on that process because every jurisdiction will have some differences in the way they understand and accept strategic fire prevention and protection planning. Dealing with those differences requires approaches that fit actual local situations, not just written guidelines. There are, however, some key actions that can facilitate political acceptance in any jurisdiction. Those actions are promoting an informed public, involving key government personnel, and implementing a professionally presented product.

Achieving protection of life, property and resources becomes more difficult as people and structures enter wildland areas at an ever-increasing rate. Existing policies and procedures indicate that the inherent problems in protecting wildland as well as life and property will be compounded in the decades ahead.

For example, Nevada County's 49er fire in 1988 exhibited all of the problems common to wildland-structural fire suppression that can be expected in the future. Initial attack and reinforcement engines were immediately forced into structure protection rather than perimeter control. Water was in short supply. Inaccessible roads and driveways hindered the defense of some structures, and accumulation of fuels adjacent to other buildings made their defense impossible. A dozer was trapped and burned in heavy fuels while trying to pioneer a control line. Air tankers had to drop as much retardant on and around structures as they did on the fire front, thus reducing perimeter control effectiveness. Major evacuations jammed roads and slowed suppression efforts. This fire destroyed 312 structures and burned 33,700 acres. In terms of structures lost, 10 out of the 20 largest wildfires in California's history, have occurred since 1990.

These losses could have been reduced or prevented with long-term planning, enabling suppression forces to do more than just react to the fire's spread on a spontaneous and tactical basis. Strategic initiative was lost before the fire started, and during the first several hours the tactical reaction was characterized more by crisis than by planned suppression. Given the current status of development in most of California's wildlands, this loss of initiative and crisis reaction will be typical of fires in the future unless some significant changes are made. Fire prevention planning can help make these changes. It can address all of the root causes of suppression problems and be a major actor in regaining the initiative in fire protection.

### **5.2 Fire Safe Land Use Planning Defined**

Fire safe land use planning is a combination of fire behavior knowledge, several decades of suppression experience and the practical application of planning law. It can be a way to infuse wildland fire and resource protection requirements into general plans and all the subsequent planning of a local jurisdiction. It is designed to provide area-wide protection systems to watersheds, localized communities and entire counties.

There are three goals for fire safe land use planning:

- (1) *To provide professional wildland suppression advice to local governments;*
- (2) *To reduce or eliminate the urban bias, and thereby bring a more balanced approach to wildland planning and development, and*
- (3) *To provide suppression forces with the best and safest chances for stopping wildfires.*

### **5.3 Fire Safe Land Use Planning Process**

One important key to successful fire safe land use planning is to understand (and believe) that planning is a legitimate exercise within the fire service's mission. It may not have been done before, and local government may not accept it eagerly, but it is a proper and worthwhile activity. From a people-oriented perspective, the process will be more effective if extra effort is expended to educate, inform and involve citizens and officials about every step of planning. Here are the technical steps involved in strategic fire prevention and protection planning.

#### Step 1. Preparation

Local and state fire protection agencies and local government(s) should be a part of the process. Inform and involve them before work actually starts. Develop a working relationship with the jurisdiction's planning director and staff, and learn their process of planning and amending general plans, since counties vary in the ways they perform these tasks. Identify and contact others who may become involved. Seek their participation in all of the activities. If some kind of multidisciplinary team can be formed, it will bring about a better final product and feelings of joint cooperation about the plan. Think about long-term strategy. Obtain State Department of Finance (DOF) population projections for the next twenty years and consider how and where these people will be integrated into the jurisdiction.

#### Step 2. Define the Fire Environment(s)

The objective of this step is to provide a comprehensive description of the local fire challenge in ways that comply with planning law and can be clearly explained to the public and elected officials.

Document the fire information in the same manner as required by OPR for other issues of concern in the data and analysis section of a general plan element. This would include both maps and a narrative on fire history and fire potential. Show how current and future development is, or may be, located in fire-prone areas. Document significant historical fires, estimating the fuel loadings and rates-of-spread, noting the locations of fire perimeters. Document historical fire numbers in relation to population and bring the data up to date. Show how population increases compare with fire incidence. Describe current fuel loadings in each fuel type in the jurisdiction and predict current rates-of-spread under average to worst conditions. Compare these with the historical information.

Much of this data is already available through CDF and local fire departments from work done on fire

management analysis and in development of other fire protection issues. However, it is probable that the data will have to be rearranged or reformatted to fit the local planning process.

### Step 3. Illustrate Potential Fire Problems

The objectives of this step are to describe what can happen under present conditions and to suggest specific ways that future fire damage can be reduced or prevented.

Use fire modeling, "gaming" and/or personal knowledge to determine and map fire potential in problem areas. Consider the average to worst fire situations in calculating the potentials. Recognize that recent fires in other jurisdictions may be a clue to potentials in your area. The number and frequency of disaster fires are growing, and they each indicate an increasing possibility that they can happen anywhere in California. Estimate potential economic and other losses associated with predicted fire problems.

The logical next step is to correlate the determined fire potentials with elements in the general plan. Here are examples of items to consider:

- A. **The land use element...**What are the current and planned areas for residential, commercial and industrial uses? Are there conflicts between land use plans and the documented fire potential? If so, how could they be resolved?
- B. **The circulation element...**How do the transportation routes relate to fire potential and suppression needs? Are evacuation potentials considered? Are helibases and helispots considered as part of the transportation system and access for fire equipment as called for in PRC 4290? Can improvements be made to reduce potentials and/or increase suppression effectiveness?
- C. **The conservation element...**Are natural resources on SRA lands threatened? How might they be better protected?
- D. **The open space element...**How does this element fit with the conservation element? Can there be a stronger relationship to enhance both? Where are the best chances for fuel breaks? How can complete networks of fuel breaks be linked together as authorized by the Government Code?
- E. **The safety element...**Are all areas of significant fire risk identified? Is the fire hazard severity scale incorporated into the element? Are there increasing levels of design and improvement requirements for the higher hazard levels? If not, what should be added?

### Step 4. Designing Fire Protection Measures

The objective of this step is to show what is needed to improve suppression effectiveness. It is the place to define how and where initiatives can be incorporated in future planning and development.

This step requires the unlearning of two old but powerful concepts. First, disregard existing planning, zoning and development. Imagine that the entire jurisdiction is undeveloped, and that the strategic plan is being prepared for undeveloped wildlands. The existing patterns of development probably will change over time. Thus, the idea here is to design protection based on actual wildland fire potential, not on the current character of development. Do not get trapped into poor protection in the future because the jurisdiction has made poor planning decisions in the past.





**Photograph 5.1.**  
**Community Firebreaks are Needed in Subdivisions**

Second, disregard funding mechanisms for the improvements. While all of the defined improvements must be realistic, efficient and justifiable, do not base decisions on the type, size or amount of strategic defense systems on the premise that CDF will have to fund the work. The designed improvements will be funded by various means as development goes forth.

The specific design tasks include:

- A. Design a complete fuel break system focused on the shelter-in-place concept. This design should be an ideal version, showing the very best possible system. Show major fuel breaks (200-300' wide) on key ridges, secondary fuel breaks (100-200') on secondary ridges, and tertiary breaks (50-100') to interconnect with other improvements. Use fire behavior and suppression knowledge in these designs and relate them to the fire hazard assessment. Divide the identified "High" and "Very High" hazards within the jurisdictions into manageable suppression areas of 30 to 300 acres, depending on slope, aspect, fuel types and fuel loading. "Low" and "Moderate" hazard areas may also need fuel breaks, depending on the overall conditions of the area.





**Photograph 5.2.**  
**Fuel Break**

- B. Add "Fuel Reduction Areas" to the fuel break design. These would be areas where fuel breaks are not feasible, but where current or future fuel loading will create suppression problems. The reduction areas might be in steep canyons, along roadsides or adjacent to secondary and tertiary fuel breaks. They could also be areas suitable for greenbelt types of improvements such as pastures, golf courses, playing fields, etc. Objectives are to: 1) plan fuel reduction to widen or strengthen fuel breaks, or 2) to interconnect fuel breaks and other strategic improvements. The actual work of reducing fuels, by whatever means, may only have to be done once, or once every ten years. However, the strategic plan should delineate the areas for zoning and development requirements into the future.



**Photograph 5.3.**  
**Fuel Reduction Area**

- B-1. Now go back and consider the constraints of existing development. Look at each place where the ideal design is hampered by the presence of structures. In each of those cases, design some kind of alternative that will give the best possible suppression effectiveness under the circumstances. The alternatives may be rerouting fuel breaks and relocating fuel reduction area boundaries, or it may be feasible to substitute additional water supply or access improvements. Whatever the situation, develop this step to provide strategic defense improvements that meet the best and safest objectives.
- C. Identify those general areas where adequate water sources are needed. If actual sources are known and available at the time of designation, they can be included. Otherwise indicate general areas only, because actual sources and future development cannot be predicted at the time of the update. Define flow and volume requirements for wildland suppression needs in each area. The strategic planning of water sources could show, for example, that individual water supplies would be less effective than fewer but larger sources in critical locations.
- D. Review the jurisdiction's current road and driveway standards for all types of development. Define the changes in these standards needed to provide adequate access, suppression effectiveness and public safety. Specify private and public culverts and bridges that need improvement to provide suppression access, now and in the future. Relate these substandard facilities to the California Environmental Quality Act (CEQA) requirements for evacuation and emergency plans and the circulation element standards in the Government Code.
  - D-1. Define air access requirements. Map locations where heliports and helispots are needed. Designate existing air tanker bases that need to be included in public safety and conservation elements to reduce or avoid future challenges from encroaching development. Relate this to water supply needs.

### Step 5. Other Facilities.

Will additional fire stations be required? If so, identify general areas.

### Step 6. Compile Data and Recommendations.

Prepare a draft proposal for changes in the jurisdiction's general plan. The proposal should include recommended policies, implementation measures, land use designations and zoning ordinance revisions that will support the strategic plan.

## **5.4 Implementing Fire Safe Land Use Plans**

The technical planning steps that have just been outlined can be done in about 60-90 working days. That's the easy part. Actually implementing the plan involves two other processes or procedures that need to be accomplished concurrently, extending both the time and effort required. One of these procedures is legal review of the general plan amendment; the other is the political process of approval and adoption by the local government.

## **5.5 The Legal Aspects**

The legal aspects are straightforward. Government Code, Section 65350 defines the process in detail. Some of the key conditions are:

- Anyone may propose amendment(s) to the existing general plan. With some exceptions, local government can conduct amendment procedures four times each year.
- Amendment procedures require notification of the public, other affected agencies and adjacent local jurisdictions. Time limits are specified for notification and replies.
- Amendments must be considered at public hearings before the local planning commission(s) and the legislative body.
- The local government as a result of public hearings and legislative prerogative may change initial contents of a proposed amendment. Amendments may be denied.
- Proposed amendments are subject to CEQA review and requirements. Title 14, California Code of Regulations Sections 15307 and 15308 provide exemptions for regulatory actions that will protect natural resources and the environment. An initial study that describes the protection values of a strategic plan is all that is necessary for CEQA compliance.

## **5.6 Time**

One practical impact of the legal process is time. Notification of other agencies, scheduling of amendment proposals, public notification and public hearings all take pre-planning. At best, an amendment that has complete support from all concerned parties, requiring no revisions, could take as long as 14 weeks to become effective. Yet few amendments enjoy that kind of progress. Most encounter obstacles that require revision or rescheduling.

## **5.7 Adoption Alternatives**

Another practical impact involves both time and procedural considerations. There are two alternatives for moving a strategic plan to adoption. One alternative is incremental, i.e. to propose one part of the plan at a time, gaining its adoption before proposing the next part. The other alternative is to move the entire

comprehensive plan through the process as a single amendment to the general plan. Each alternative has advantages and disadvantages. The incremental process will take significantly longer, but it may provide some fire prevention and protection improvements a little sooner. The comprehensive approach should take less time initially, but one strong objection to part of the plan could delay the whole thing until revisions are made and supported.

The local planning department(s) affected by any strategic plan proposal can be of aid in helping to move it through the legal process. This is further justification for involving them in the planning effort.

## **5.8 The Political Process**

The political process is not as clear-cut as the legal procedure. Elected officials have tremendous powers, and they may "just say no" to a proposal regardless of its professional accuracy or protection necessity. It is almost certain that some of the decision-makers will have philosophical resistance to a fire safe land use plan. They may also misunderstand the issues of private property rights and taking land. Special interests in the jurisdiction may also have the same orientations and offer objections. These political obstacles can be formidable. Here are suggestions to overcome those obstacles:

- An informed public (including elected and appointed officials) can be a strong positive influence on the outcome of a strategic planning effort. A coordinated public information and education plan should be part of the planning process.
- Do not surprise the local leaders with a completed plan and amendment proposal that they did not know was coming. Inform and involve them from the outset, as noted in the preparation step outlined earlier. Throughout the process, information and involvement contacts should be made to expose potential resistance and to find legitimate ways to overcome it.
- Assure them that the strategic plan is solidly based on scientific and professional knowledge. Propose the amendment(s) in a format that includes reference to, and compliance with, planning law.

A good reference on this subject is *Citizens Involved, Handle with Care*, by Dr. Jean Mater.

## 6. FIRE HAZARD ASSESSMENT

### 6.1 Assessment Tools and Application

Wildfire is a hazard wherever people and residential developments intermix with the wildlands. However, the degree of hazard and the required amount of fire safety measures vary from area to area. Identifying areas of differing severity provides for the application of reasonable fire-safe standards based on the actual threat present. However, remember that there is a baseline of fire prevention or fire-safe activities that must be applied to obtain a basic level of protection.

Local government land use planning agencies need to identify and classify areas of varying fire hazard severity and specify the conditions under which development and use of these areas may occur. Fire agencies need to assess their protection responsibilities for applying appropriate fire prevention programs and targeting critical areas for special programs. Insurance companies have shown a significant interest in wildland fire hazard assessment following the Painted Cave (1990) and Tunnel (1991) fires.

To take effective action, involved personnel must understand the elements, components and factors that contribute to the problem. The expertise of the agency and the complexity of the problem need to be considered when selecting an assessment process. CDF can assist local agencies in developing their fire hazard assessment analysis.

### 6.2 Fire Hazard Severity Zones (FHSZ)

In 1973, CDF developed a fire hazard severity classification system for SRA to provide land use planners a practical and logical system for classifying the severity of fire hazard in California's wildlands. Fuel loading (the quantity of flammable vegetation and other fuel per unit of land area), fire weather and slope are the primary criteria for identifying and classifying the severity of the fire hazard in any given area. In order for planners, developers and fire authorities to have a uniform understanding of the area of reference, these fire hazardous areas were, in many cases, delineated on U.S. Geological Survey (USGS) topographic maps. These maps served as the basic tools in defining fire hazard severity and effectively administering fire safety measures until new fire hazard severity zones were defined in the early 1980s.

Legislation implemented in 1981 and amended in 1982 required CDF to classify wildland fire hazard severity zones within SRA for the purpose of *"identifying measures to be taken to retard the rate of spreading and to reduce the potential intensity of uncontrolled fires that threaten to destroy resources, life or property. The zoning identifies where the potential of large, destructive wildfires exists"* (PRC 4201). Each fire hazard zone *"shall embrace relatively homogeneous lands and shall be based on fuel loading, slope, fire weather, and other relevant factors present"* (PRC 4202). Two factors primarily determine the potential for large, destructive wildfires: 1) expected fire behavior and 2) difficulty in fire containment. The Burning Index (BI) of the National Fire Danger Rating System (NFDRS) describes these factors, which are the basis for this classification system. The method for comparing fire hazard severity in differing areas of the state was to compare the frequency with which the BI exceeded a rating of 61. Above this threshold, firefighters can expect severe fire behavior, significant difficulty in containing the spread of the fire, and spotting of fire brands and burning embers over 1 mile in advance of the fire front.

The SRA zones were intentionally assessed without including the additional elements of value and risk. These fire hazard severity zones were adopted and implemented in August 1988. The State Fire Marshal, as directed by the Legislature, has adopted fire resistive roofing regulations that overlay the zones and

SRA. Additional requirements specify public and county review of the SRA zones and periodic review and update by CDF (PRC 4203 and 4204).

Some of these regulations were amended by the passage of AB 337 (Bates) and AB 3819 (Brown). These laws require fire hazard assessment and mitigation standards in LRA. CDF was also directed to participate in the LRA assessment, but local agencies have been given the right and the responsibility to ratify or reject CDF recommendations for Very High Fire Hazard Severity Zones (VHFHSZ). Therefore, non-identification of a VHFHSZ in an LRA jurisdiction under “Bates” does not necessarily mean a very high fire hazard is not present. If the local jurisdiction already met or exceeded the minimum standards in Section 51182 of the Government Code per AB 337, then the jurisdiction was exempted from assessment requirements. This means that there are many more areas in California that qualify as VHFHSZ than were identified by CDF. Nonetheless, standardized and/or customized maps and digital data of the LRA hazard assessment (VHFHSZ) may be obtained at a cost from the Teale Data Center, GIS Technology Center, Post Office Box 13436, Sacramento, California 95813-4436, (916) 263-1767, and FAX (916) 263-1346. Additional information and maps to view or download are also available on the Internet at <http://ceres.ca.gov/planning/nhd>. Synopses of AB 337 (Bates) and AB 3819 (Brown) are also contained in Appendices G and I of this document.

As part of a FEMA grant, CDF has evaluated some of the various rating systems in place by other departments and the insurance industry. The USDA Forest Service is studying a system that uses fuels, elevation, slope and aspect in combination. It has been tested on the San Bernardino and other Southern California forests. The ISO has in place a system using four fuel types, slope, aspect, and dead-end roads to determine risk. Several insurance companies are currently utilizing this system. As a result of the *Wildland Fire Hazard Assessment* FEMA study (see Chapters III and IV), future hazard assessment recommendations are being made that closely resemble the latest GIS technology developments in conjunction with the CDF California Fire Plan update, but no related mapping projects have yet been undertaken.



## 7. ENVIRONMENTAL REVIEW OF DEVELOPMENT

The California Environmental Quality Act (CEQA), PRC 21000 et seq., was developed to provide a process for review and approval of activities that affect the environment. This process is outlined in the *CEQA Guidelines* (<http://ceres.ca.gov/qeqa/>) prepared by the Secretary of Resources. The statute and the guidelines are frequently amended, and specific questions and references should be to the most current version of the statute or guideline.

In many cases, the first contact with a project or development is through the review of an environmental impact report (EIR) submitted by a project proponent. This is the earliest official opportunity for fire service comment. In many cases, the proponent has already contacted the appropriate agencies before preparation of the report. CDF and fire department staff should review appropriate permits and tentative maps relating to development and construction in SRA for appropriate wildland fire hazard mitigation. The recommendations presented through the local jurisdiction should be taken from the forest and fire laws and requirements contained in Title 14, California Code of Regulations, Section 1270 et seq. (T14, CCR, 1270 et seq.). CDF and fire department staff should also review project environmental documentation provided via the local jurisdiction for conformance with T14, CCR, Sec. 1270 et seq., the forest and fire laws, and other CDF program interests.

As the state's wildland fire protection agency, CDF becomes the responsible agency on many projects in SRA, requiring receipt and review of project environmental documentation. Where deficiencies in the general plan are identified, the deficiencies should be noted and passed through the chain of command. The notice should include a clear description of the deficiency and recommendations or alternatives for correction. An excellent reference is the *Guide to the California Environmental Quality Act (CEQA)*, by Daniel J. Curtin, Jr. A good example of an EIR that addresses fire management is the *Mt. Tamalpais EIR*, by Charles Leonard & Associates.

### 7.1 Processing

Environmental project documentation for discretionary projects received from the county should be routed back to the county after comments have been made. CDF review of permit applications and tentative maps shall be accomplished within the time frames set by, and in use by, the local jurisdiction.

### 7.2 Reviewing Projects

When environmental documentation for a discretionary project or a ministerial project is being processed at the local level, it is preferable to meet with an applicant to discuss construction and development requirements to review possible exceptions and alternatives prior to the submission of a tentative map or application for a permit. Initial review and joint inspections of the project site with the applicant may resolve many problems, easing the reviewer's time commitment and simplifying negotiations and approval. Station personnel, battalion chiefs, division chiefs and resource management personnel should be involved and consulted when appropriate. Meeting records should be kept for future review.

### **7.3 Inspection of Projects**

During preliminary field inspections of projects, the adequacy of proposed activities, measures and practices should be reviewed and discussed. Requests for alternatives or exceptions should be evaluated and, if warranted, should be endorsed. Where alternatives are not appropriate, the inspector should provide recommendations. Field notes should be taken, and a letter to the applicant indicating areas of agreement and disagreement, as well as recommendations, should be prepared. In all cases, reference all documents to the project using the parcel number or project number and retain a copy of all notes and transmittals. If possible, station, battalion or supervisory personnel should be involved.

Inspections following the issuance of an application or approval of a tentative parcel map should evaluate the conformance of project activities with the conditions placed on the permit or map and notes taken during any preliminary meeting or inspection. Documentation of non-conforming activities and measures shall be based on local procedures.



## 8. WILDLAND FIRE SAFE REGULATIONS

### 8.1 Background

In 1986, the California Board of Forestry, supported by CDF, introduced legislation (Senate Bill 1075, Rogers) to develop minimum statewide standards for defensible space in State Responsibility Areas (SRA). This legislation was motivated by local government's general lack of response to wildland fire prevention and protection problems over the previous 20 years. This comprehensive wildland fire safety legislation was passed by the Legislature and signed by the Governor in 1987. SB1075 required the California Board of Forestry to establish minimum fire safety requirements that applied to SRA. Regulation development began in earnest early in 1988, and final implementation of the state and local regulation packages occurred on January 1, 1992 via PRC 4290. These requirements address emergency access and water supplies, addressing and street signing, and fuel modification relating to new construction and development.

While a large block of forestland generally experiences limited fire occurrence, the level of risk increases directly with the influx of population due to development and construction. Before roads and houses are built, there is little need for rules and regulations beyond some general forest and fire laws. However, roads and houses bring with them more fires and greater values at risk than just grass, brush and trees. As development occurs, there becomes a need to require built-in fire prevention. The developer and the homeowner are required to shoulder some of the responsibility for fire prevention. They should not just expect the fire department to solve the problem. Regulations target these areas where homes are encroaching on wildland and watershed areas and change the equation and cost of wildland fire prevention and protection. Construction and development trigger these regulations.

### 8.2 Administrative Elements

The implementation of these regulations occurs through the local government building permit and subdivision map approval process. Local government is still the approving authority for development. These regulations are triggered by the application for a building permit for purposes other than limited remodels, including but not limited to submittal of a subdivision map, application for a use permit, siting a mobile or manufactured home, or constructing a road. These regulations do not supersede existing local regulations that are equal to or more stringent than the state regulations.

CDF has been given the role of wildland fire protection expert and is provided the opportunity to review and comment on all proposed construction and development within the SRA. If a project or mitigation appeal is filed, CDF can present the relevant wildfire prevention issues and needs to the appeal board. The county is granted the authority to make the final ruling on the appeal, but must provide the California Board of Forestry with findings if the appeal is granted.

Locally developed rules are more responsive to the local constituency and local environmental conditions. They can be finely tuned to local wildfire suppression strategies and needs. The proposed local rules must provide for the same practical effect as the overall state regulation package. Each protection measure and activity cannot be judged alone, but must be compared to the overall protection provided by the total regulation package. Many counties have selected this option and have prepared and submitted certification packages. For more information refer to the *PRC 4290 Guidebook* at \_\_\_\_\_.

The regulations also provide for exceptions to the rules due to health, safety, environmental and physical

site limitations. In fact, the developer or owner may propose a reasonable alternative outside of the criteria listed above. If it is impossible to change the width of a road, other options must be evaluated. In this case, reduced road length, safety islands, fuel modification along the road, and turnout construction might be acceptable alternatives to allow for a narrower road.

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## 8.4 Infrastructure

### 8.4a Access

Access is a major fire prevention and protection need, whether wildland or structural. Failure to provide reasonable access for emergency equipment and evacuation exits for civilians can result in major loss of life, property and natural resources. Fire apparatus sitting at an intersection, waiting for civilians to exit on a narrow road, cannot provide the necessary fire suppression action. Safe access requires street and road networks that limit dead-end roads and provide reasonable widths, grades and curves on all roads and driveways.

Road networks should provide unobstructed traffic circulation during a wildfire emergency. CDF recommends two separate points of ingress/egress to each development. Alternate routes of escape that will safely handle evacuations and emergency equipment should be established. Road and street systems should provide maximum circulation consistent with topography to meet fire safety needs. The following standards are recommended for subdivisions:



**Photograph 8.1.**  
**Inadequate Access**

- **Access Routes** - PRC 4290 requires at least two different public ingress/egress routes on all roads.
- **Road Width** - All roads shall be constructed to provide a minimum of two nine-foot traffic lanes providing two-way traffic flow. Additional requirements shall be mandated by local jurisdictions.

- **Roadway Surface** - The surface shall provide unobstructed access to conventional drive vehicles, including sedans and fire engines. Surfaces should be established in conformance with local ordinances and be capable of supporting a minimum 40,000-pound load.
- **Roadway Grades** - The grade for all roads, streets, private lanes and driveways shall not exceed 16 percent.
- **Roadway Radius** - No roadway shall have a horizontal inside radius curvature of less than 50 feet. Additional surface width of 4 feet shall be added to curves of 50-100 feet radius--2 feet to those from 100-200 feet. The length of vertical curves in roadways, exclusive of gutters, ditches and drainage structures designed to hold or divert water, shall not be less than 100 feet.



**Photograph 8.2.**  
**Roadway to Rural Structure**



- **Roadway Turnarounds** - Turnarounds are required on driveways and dead-end roads as specified. The minimum turning radius for a turnaround shall be 40 feet from the centerline of the road. If a hammerhead “T” is used, the top of the “T” shall be a minimum of 60 feet in length.



**Photograph 8.3.**  
**Turnaround**

- **Roadway Turnouts** - Turnouts shall be a minimum 25-foot taper on each end.
- **Roadway Structures** - All driveway, street and private lane roadway structures shall be constructed to carry at least the maximum load and provide the minimum vertical clearance as required by Vehicle Code Sections 35550, 35760 and 35250. A bridge with only one traffic lane may be authorized by the local jurisdiction; however, it shall provide for unobstructed visibility from one end to the other and turnouts at both ends.
- **One-Way Roads** - All one-way roads shall be constructed to provide a minimum of one 10-foot traffic lane. The local jurisdiction may approve one-way roads. All one-way roads shall connect to a two-lane roadway at both ends and shall provide access to an area currently zoned for no more than 10 dwelling units. In no case shall it exceed 2640 feet in length. A turnout shall be placed and constructed at approximately the midpoint of each one-way road.

- **Dead-End Roads** - The maximum length of a dead-end road shall not exceed cumulative lengths, regardless of the number of parcels served.

PARCELS ZONED FOR LESS THAN ONE ACRE	800 ft
PARCELS ZONED FOR 1 ACRE TO 4.99 ACRES	1320 ft
PARCELS ZONED FOR 5 ACRES TO 19.99 ACRES	2640 ft
PARCELS ZONED FOR 20 ACRES OR LARGER	5280 ft

All lengths shall be measured from the edge of the roadway surfaces at the intersection that begins the road. Where parcels are zoned 5 acres or larger, turnouts shall be provided at a maximum of 1320 foot intervals. Each dead-end road shall have a turnaround constructed at its terminus.

- **Driveways** - All driveways shall provide a minimum 10-foot traffic lane and unobstructed vertical clearance of 15 feet along its entire length. Driveways exceeding 150 feet in length, but less than 800 feet in length, shall provide a turnout near the midpoint of the driveway. A turnaround shall be provided at all building sites on driveways over 300 feet in length and shall be within 50 feet of the building.
- **Gate Entrances** - Gate entrances shall be at least two feet wider than the width of the traffic lane serving that gate. All gates providing access from a road to a driveway shall be located at least 30 feet from the roadway and open to allow a vehicle to stop without obstructing traffic. Where a one-way road with a single traffic lane provides access to a gated entrance, a 40-foot-turning radius shall be used.



**Photograph 8.4.**  
**Gate**

- **Bridges** - Bridges should have a minimum load of 40,000 pounds (20 tons) and be no narrower than the driving portion of road serving each end. Major ingress/egress roads in subdivisions should have a minimum load limit on bridges of 80,000 pounds (40 tons).



### 8.4b Addressing and Street Signing

The difficulty of locating an unnamed or poorly signed road during an emergency, especially under smoky conditions, is a major problem to wildland and structural firefighters. Beyond this, many jurisdictions have allowed duplicate numbering and naming for roads and access, further compounding the location problem. The potential losses of resources, property and life are greater without an adequately visible and consistent addressing and numbering system.

Street signs and building addresses are necessary to facilitate the location of a fire and to avoid delays in response. All existing and newly constructed or approved roads, streets and buildings shall be designated by names or numbers posted on signs clearly visible and legible from the roadway.



**Photograph 8.5.**  
**Street Signs**

- **Street and Road Identification Sign** - Street sign numbers must be not less than 3 inches high and not less than 3/8 inch in stroke. All numbers and/or names required must be located or positioned not less than 3 feet, or more than 6 feet above the ground level, so as to be visible to emergency equipment for a distance of not less than 100 feet from either direction on the traveled road. Numbers and/or names must also be reflectorized, with contrasting background.
- **Buildings and Structures** - Every building or structure must be provided with an appropriate noncombustible marker, located with respect to the nearest public highway, street or road, servicing such building or structure so as to be clearly visible at all times to an approaching vehicle for a distance of not less than 100 feet.





**Photograph 8.6.**  
**Structure Identification**

- **Structure Identification Numbers** - Structure identification numbers should be at least 3 inches in height, with a 3/8-inch stroke. In lieu of providing a separate marker and a separate building or close grouping of several buildings or a structure identification number, the fire protection agency may recommend that a cluster of buildings comprising a single occupancy use one marker and one identification number as a location identifier.

#### **8.4c Water Supplies**

The application of water and the construction of a fire line are the primary tools used by wildland firefighters to contain and control a wildfire. The siting and availability of sufficient quantities of water are essential to fire suppression and firefighter safety. While a single system of water delivery and/or storage is adequate, the effectiveness of any suppression system increases with diversity.

Emergency water supplies are necessary to provide available and accessible emergency water for wildfire protection, in sufficient quantities and locations to attack a wildfire or defend property from a wildfire. Such emergency water may be provided in a fire agency mobile water tender, or naturally occurring or manmade containment structure, as long as the specified quantity is immediately available. Water should be available on-site prior to the completion of road construction where a community water system is approved, or prior to the completion of building construction where an individual system is approved.

Water systems that meet or exceed the standards specified in the Public Utilities Commission of California (PUC) revised **General Order #103**, Section VIII, **Fire Protection Standards** and other sections relating to fire protection water delivery systems; static water systems equaling or exceeding the National Fire Protection Association (NFPA) Standard 1231, **Standard on Water Supplies for Suburban and Rural**

**Fire Fighting**; or mobile water systems that meet the Insurance Services Office **Rural Class 8 Standard**, shall be considered as meeting the requirements of wildland fire protection. On-site emergency storage where a community system exists should be considered supplemental to the required fire flow provided through the community system.

Water is the most important single factor in fighting structural fires and is vital in suppressing wildland fires. Therefore, to assure adequate and reliable water supplies for community fire prevention and protection in hazardous areas, the following minimum requirements shall be met:

- **Water Mains** - The minimum size of water distribution mains on which fire hydrants are located should be 8 inches in a system designed to permit circulating water flow.
- **Fire Hydrants** - The size, type and location of fire hydrants should meet the approval of the responsible fire authority and of applicable state and county regulations, with a minimum size of waterway not smaller than the size of the street main, up to a nominal 8-inch size. A 6-inch lateral to the hydrant is permitted. Dry barrel hydrants should conform to American Water Works Association (AWWA) **Standard C-502**. Wet barrel hydrants should conform to AWWA **Standard C-503**. All hydrants should be designed for a working pressure of 150 psi. A gate valve should be placed on the connection between main and hydrants. Hydrant spacing should not exceed 660 feet, with minimum fire flow of 750 gpm required for population densities of two or less single family residences per acre. For population densities of more than two dwellings per acre, hydrant spacing should not exceed 330 feet, with a minimum fire flow of 1000 gpm, and more where structural conditions require. Fire flow quantities should be available at 30-psi residual pressure in extreme fire hazard areas and 20-psi residual in low, moderate or high areas. Water source facilities should have the capacity to support the required fire flow for a minimum duration of two hours, in addition to the maximum daily flow requirements for other consumptive uses.



**Photograph 8.7.**  
**Alternate Water Supply**

- **Water Storage** - Water storage may be required to assure the required minimum duration fire flow of two hours. Built-up areas served by pumping units with nonexistent or limited gravity storage may require certain other features of reliability such as alternate power sources, duplicate pumps or additional gravity storage in case of main breaks, mechanical failure of pumping units or loss of primary power source. The local fire authority may adjust the water quantities and duration set forth on the basis of local conditions, exposure, congestion, and construction of buildings.
- **Lakes, Ponds, Swimming Pools, Streams or Other Water Sources** - Establish access for fire equipment. Emergency equipment must be able to get within 12 feet of these water sources to effectively obtain the water. All subdivision and development plans should have these water fill or drafting sources noted or identified on the development map.
- **Private Water Supply** - Separately developed dwellings with an individual private water supply should provide an acceptable guaranteed minimum supply of water, in addition to the amount required for domestic needs. The amount of water available for structure protection will vary. The local fire authority should be consulted to establish specific water requirements. Water storage capacity should not be less than 2,500 gallons, with supply mains of at least 2 1/2 inches, preferably a 4-inch diameter standpipe, located for fire engine filling, and at least two hose outlets no less than 50 feet from the building. If the water supply is dependent on an electrical pump, it should be installed with an independent electrical system or backup generator.

#### 8.4d Fuel Modification Considerations

The establishment of physical barriers between a structure and the wildland is recognized as a major deterrent and loss reduction measure. Such barriers should be considered key to individual and community defensible space. While fuel breaks have strategic application over large geographical areas, they are expensive to construct and maintain. Other measures, such as the strategic siting of roads, recreational parks, irrigated landscaping, setback from property lines and fuel modification around structures are more suitable around homes and subdivisions. For information on fire resistant landscape plants, go to <http://www.prefire.ucfpl.ucop.edu/vegetati.htm>.



**Photograph 8.9.**  
**Shaded Fuel Break**



Fuel modification is necessary to reduce the intensity of a wildfire by reducing the volume and density of flammable vegetation. Fuel modification will provide: 1) increased safety for emergency fire equipment and evacuating civilians, 2) a point of attack or defense from a wildfire, and 3) strategic siting of fuel modification and greenbelts. CEQA review of projects and site-specific mitigation at the permit and map review stage shall be conducted to secure perimeter and interior fuel modification zones, including building setback to apply PRC 4291 fuel modification zones along roads and to the strategic siting of greenbelts.

#### **8.4e Roadside Vegetation Management**

Roadside vegetation should be removed for a distance of 10 feet on each side of the traveled section. In order to protect escape routes from radiant heat caused by wildfires, the native vegetation should be thinned and dead material removed on each side of roads or highways to reduce radiant heat from wildfire to a tolerable level.



**Photograph 8.10.**  
**Roadside Vegetation**

#### **8.4f Right-of-Way Fuel Modification**

The clearance distances and type or amount of fuel management needed depends on local conditions. Fuel modification areas should extend at least 100 feet, and up to 300 feet if needed, from the edge of the roadway to be beneficial as a fire defense system. Fire protection agencies can provide fuel treatment directions for planning purposes. Other methods of treatment include pruning the lower limbs of trees over 12 feet tall and planting fire resistive ornamental shrubbery and cultivated ground cover such as green grass, ivy, succulents or similar plants in forms that do not readily transmit fire.

#### **8.4g Planting Under and Near Power Lines**

Trees planted under utility lines should reach a maximum height of 20-25 feet at maturity. Trees taller than 25 feet at maturity should be planted far enough away that branches do not come within 10 feet of the conductors. Proper selection of trees under or near power lines can reduce hazards, limit the need for pruning on a regular basis and add to the beauty of the landscape. Christmas tree farms under active management may be authorized.

#### **8.4h Power Utility Systems**

All new electrical distribution lines and extensions of existing lines in fire hazardous areas should be constructed using the latest approved methods that minimize fire hazards.

## 9. RECOMMENDED FIRE SAFE STANDARDS

State regulations, and to some extent local ordinances, are minimum standards that substantially imply the need for more stringent pre-fire management standards. The nature of the regulatory process creates a series of standards that are predicated upon minimums, yet become maximums when applied as law. This certainly applies to wildland fire prevention standards. The regulations discussed in the last chapter are minimum standards. There is a need in many cases to promote a greater level of protection for less vulnerability. This is certainly an option for any homeowner or developer. The design and construction of structures, subdivisions and developments in the wildlands of California should provide for defensible space and built-in wildland fire prevention. This should be a common goal with interested state agencies, local jurisdictions and fire agencies.

### 9.1 National Fire Codes

The National Fire Codes are a product of the National Fire Protection Association (NFPA). These model codes are annually compiled from the codes, standards, recommended practices, manuals, guides and model laws that are prepared by the individual technical committees of NFPA. The members of NFPA adopt the published codes. The individual codes are in many cases adopted by jurisdictions, or modified and adopted as that jurisdiction's ordinance. For more information about NFPA, go to <http://www.nfpa.com>.

### 9.2 Uniform Fire Code

The Uniform Fire Code (UFC) is a product of the International Fire Code Institute (IFCI). This Code is a model code that is designed for adoption by local jurisdictions. Many jurisdictions have amended and modified the UFC as their local fire code. IFCI, recognizing the growing problem in the Western United States, has also developed the *Urban-Wildland Interface Code*, 1997 Edition, which is available through their office. Contact IFCI at <http://www.ifci.com>.

### 9.3 Uniform Building Code

California has adopted the Uniform Building Code (UBC), with state-adopted modifications, as the standard for construction known as the California Building Code (CBC). In support of this standard, most counties have adopted the National Electrical Code (NEC) and the Uniform Plumbing Code (UPC) to regulate construction. These codes have been written to work in concert with each other; however, they do not recognize nor address the Urban-Wildland Interface fire problem, since they were not developed with California's specific environment in mind. Location of structures and subdivisions and the allowable exterior building materials may incorporate wildfire vulnerability into new homes and developments. There is a lack of consistency between adjacent jurisdictions and statewide areas as to what is and is not authorized in terms of wildland fire prevention and protection. The California Building Standards Commission can be contacted at <http://www.dgs.ca.gov/bsc>.

Every new building or remodel of an existing structure should be constructed to at least meet the requirements specified in the current edition of the CBC as outlined by the International Conference of Building Officials (ICBO) for the group and type of occupancy intended. More stringent standards may be necessary as determined by the local jurisdiction. Specific sections, including spark arresters and fire department access, should be consulted and reviewed. For more information about ICBO, go to <http://www.icbo.org>.

## **9.4 Local Regulations and Ordinances**

A more restrictive provision shall supersede the requirements of the Uniform Building Code when required by other statutes or regulations adopted pursuant to statutory authority or by any local ordinance.

## **9.5 Siting, Spacing and Density Considerations**

Structure density, spacing and siting should be based on the fire hazard severity classification and the on-site topography. As fuels and slopes increase, low density or planned unit developments should be considered. From a protection standpoint, it is easier to protect these two types of developments.

Buildings must be set back at least 30 feet from the property line on parcels one acre and larger (PRC 4290). Since close spacing is common in mobile home parks, those situated in wildland areas are particularly susceptible to destruction by wildfire. Spacing should conform to those standards already mentioned.

Building densities should be as follows:

- 15-30 percent slope, no more than three dwellings per acre.
- 31-50 percent slope, no more than one dwelling per 3-5 acres.
- Where slopes and fuels exhibit very high fire hazard, local government should prohibit development or apply more stringent standards.
- In all cases, development of ridge tops, canyons or ridgeline saddles should be limited or mitigated with greater levels of built-in fire prevention.



**Photograph 9.1.  
Structure Siting**



## **9.6 Lot Development**

Lots that front on two or more streets should provide access for vehicles from the street to which the address is assigned. All new access roads and driveways must conform to local fire safe standards.



**Photograph 9.2.**  
**Lot Development**

## **9.7 Building Construction Standards**

### **9.7a Structure Vulnerability**

Professional experience and research have documented the two most vulnerable elements of a structure: the roof and the flammable vegetation around the structure. CDF has several research projects in progress that will add to the wealth of professional knowledge that currently guides wildland fire prevention. While not available at the time this guide was printed, interested individuals should contact the local CDF office for current information. Additional information is also available on the Internet at <http://www.ucfpl.ucop.edu>.

### **9.7b Roofing**

One common issue surfaces among the numerous reports, papers and tasks related to the problem of homes and developments constructed in areas with potential for major wildfire conflagrations: flammable, non-rated wood shakes and shingles have made buildings especially vulnerable to ignition from flaming material carried by the winds and convection columns in advance of a fire front. Once wood shakes and shingles have ignited one building, they are torn away by the wind and rapidly carried by the convection column to ignite additional vegetation and roofs of other buildings. The roof is the most vulnerable part of a building during a wildland conflagration. A roof that is horizontal is especially vulnerable because it can catch and hold firebrands carried by strong winds and convection columns characteristic of these fires. Unlike

ground fire, a conflagration produces firebrands that travel over and beyond any natural or artificial fire break and are a distinct hazard to structures as far as a mile away from the wildfire.



**Photograph 9.3.**  
**Shake Shingles Before and After a Fire**

### **9.7c One Preliminary Study**

Following the devastating series of fires in June and July of 1985 in Southern California, CDF sponsored a study by the University of California to evaluate the structure loss on two of the fires that occurred during this period. Of the 42 homes with asphalt and fiberglass roofs that were threatened, 37, or 88 percent, were not destroyed. Of the nine houses with shake roofs, six, or 67 percent, were not destroyed. The study also pointed out that a house with a fire retardant roof had a 70 percent better chance of surviving a wildfire, even when flammable vegetation had not been cleared as required by PRC 4291.

### **9.7d Roofs Contribute to Fire Spread**

During wildfires, structural ignition comes from any of three sources: direct exposure to the flames, radiated heat or firebrands carried by winds or convection columns. The roof is the most common structural fuel bed for ignition by these flying firebrands. Therefore, fire retardant roofing materials are of prime importance as a personal protection and fire prevention measure.

Test methods have been developed to evaluate the fire hazards of roof coverings. NFPA 256, *Methods of Fire Tests of Roof Coverings*, describes the appropriate procedures. The test evaluates the flammability of the roof covering, the protection it provides to a combustible roof deck, and the potential for producing flaming brands. Roof materials are classified as Class A, Class B, and Class C. To receive one of the classifications, the roof covering is given a series of fire tests of varying degree of severity. After all roof-covering tests have been conducted, roof coverings are classified based upon test results:

- Class A covering is one that is effective against a severe fire exposure, affords a high degree of fire prevention to the roof deck, does not slip from position, and does not present a flying brand hazard.
- A Class B roof covering is one that is effective against a moderate fire exposure, affords a moderate degree of fire prevention to the roof deck, does not slip from position, and does not present a flying brand hazard.

- A Class C covering is effective against light test exposure, provides a light degree of fire prevention to the roof deck, does not slip from position, and does not present a flying brand hazard.



**Photograph 9.4.**  
**Class A Roof**

The specific definition of each roofing classification is dependent upon the roofing material, roofing support construction and sheathing. With a given surface material, the classification may change, depending on whether the sheathing is solid (plywood) or lath, and whether the underlay material is foil, tar paper or felt (different weights available). The Class A rating provides the most fire resistive characteristics.

Roof coverings may not be the only failure contributing to the rapid spread of fires. All structural features (roofs, siding, windows and eaves) need to be evaluated for their ability to provide an acceptable level of safety for the homeowner during a wildland fire.

It is especially important that the roof be kept free of flammable material such as pine needles. Tile roofs should also be plugged in the ends of the tile rows because bird nests were shown to be a significant cause of house loss via fire entry from the roof. Additional information is also available on the Internet at <http://www.ucfpl.ucop.edu>.

#### **9.7e Roof Covering Requirement**

New regulations affecting roof coverings have been established pursuant to AB 423 (Chapter 380, Statutes of 1999). Roof covering regulations are located in the 1998 California Building Code, Sections 1503.1-1503.3. See Section 1502 for the definition of fire-retardant shakes and shingles.



### **9.7f Sprinkler Systems**

Automatic and/or manual roof sprinkler systems will not substitute for the required roof covering, as these systems are too unreliable. Roof sprinklers are also not a substitute for on-site or nearby emergency water storage. Residential sprinklers are highly recommended to protect a family and to prevent the spread of an interior structure fire to the wildlands; however, they are not a substitute for nearby or on-site emergency water storage.

### **9.7g Eaves, Balconies, Unenclosed Roofs and Floors**

Eaves, balconies, unenclosed roofs and floors and other similar surfaces should be protected on the exposed underside by materials approved for one-hour fire resistant construction. All supporting members (vertical, horizontal and diagonal) used in stilt or cantilevered construction shall be built to one-hour fire resistant construction as set forth in the 1998 California Building Code, Chapter 7.

### **9.7h Chimneys and Vents**

Every chimney or vent attached to any solid or liquid fuel-burning device shall be provided with an approved, securely attached spark arrester conforming to requirements outlined in the 1998 California Building Code, Section 3102.3.8(a) relating to spark arresters. The spark arrester shall be maintained, in working condition, mounted in a vertical or near vertical position, and visible from the ground (PRC 4291[c] and [f]).

All attic openings, soffit vents, foundation louvers or other ventilation openings in vertical exterior walls, eave overhangs and vents through a roof should not exceed 144 square inches each, and covered with one-quarter-inch mesh metal screens which are corrosion resistant. Pre-cut, fire resistive vent covers should be available for installation when a wildfire is threatening.



**Photograph 9.5.  
Dormer Vent and Chimneys**

### **9.7i Exterior Walls**

Exterior walls of buildings should be protected with materials of not less than one-hour fire resistant construction on the exterior side (see Table 7-B of the CBC). The materials should extend from the top of the foundation to the underside of the roof sheathing.

### **9.7j Rafters**

The spaces between rafters, the wall plate line and the underside of the roof sheathing should be filled with not less than two-inch nominal thickness wood or equivalent solid blocking.

### **9.7k Windows**

The vulnerability of windows to wildfire is currently being debated. Until that debate is settled, it is prudent to take the position that windows are a vulnerability. Windows, especially large vista windows, should be limited in number on the side of a building that faces high hazard fuels. Windows should be dual or triple-paned to resist breaking and radiant heat. These window types are also energy efficient. Fire resistive shutters should be constructed in advance and be available to cover all windows when a wildfire is threatening.

### **9.7l Dooryard Activities**

Firewood piles and LPG tanks (UFC Section 8209) should be located a minimum of 30 feet from any structure. Each should be provided a 10-foot clearance of flammable vegetation and material in all directions. Firewood piles, smoldering after the fire has passed, have contributed to the loss of many homes that otherwise survived the initial fire onslaught.

LPG tanks, when overheated, can explode, sending large pieces of shrapnel and flaming gas in all directions. The LPG pressure relief valve in this case is overwhelmed and is unable to release the required pressure. In many cases, the pressure relief stream is ignited and becomes a blowtorch. The pressure relief valve should be directed away from any structure or access road.



**Photograph 9.6.**  
**LPG Tank**

## **10. FUELS AND VEGETATION IN RESIDENTIAL DEVELOPMENTS**

Major wildland fires do not occur just in large acres of heavy fuels. Major fires and major losses can occur in any fuel type when all of the "right" conditions are present. All vegetation is flammable to some extent. However, the intensity and speed of spreading fire depends upon the time of year, the moisture content of the fuels, the weather, the topography and the size and arrangement of the fuels. Fine fuels such as grass can ignite easily and will burn very fast while generating little heat. Grass fires are generally easy to extinguish. Heavier and larger fuels are hard to ignite and generally burn very hot and slow, are more difficult to distinguish and generate a lot of heat. Fatalities and damage to resources and property can occur under a wide range of conditions and fuels. Treatment of wildland fuels includes modification of the size, arrangement and type of fuel to reduce the probability that a fire will start and reduce the subsequent damage.

### **10.1 Fire Resistive Landscaping**

If enough heat is present, almost any plant will burn. The objective of fire resistive landscaping is to reduce the heat available and reduce the chance of ignition. Fire resistive landscaping combines native or ornamental plants with proper placement and proper maintenance. The key is separating plants vertically and horizontally to prevent fire spread and extension. If proper clearance of flammable vegetation has not occurred or where a fire resistive landscaping has not been planted, some insurance companies add a surcharge to the home insurance policy.



**Photograph 10.1.  
Fire Safe Landscaping**

A listing of information and properties of some common landscaping plants was developed by the University of California Forest Products Laboratory. This *Defensible Space Landscaping in the Urban/Wildland Interface: A Compilation of Fire Performance Ratings of Residential Landscape Plants* is available through the Forest Products Lab and may be viewed on their Web Page <http://www.ucfpl.ucop.edu>. In addition, the Cal Poly, San Luis Obispo Home Page <http://www.calpoly.edu> contains a good reference guide on growing characteristics for a large number of trees, including heights and recommended growing space requirements.

### **10.1a Climate and Environment**

Obviously, some species are better than others. More importantly, some plant species just won't grow in certain climate zones. Consult your local nursery, fire department or CDF for proper selections in your area. Consideration of soil protection and visual impact during fuel modification planning is essential to a successful project. However, inappropriate modification of the native landscape can create serious problems such as slope failures, soil erosion, damaged wildlife habitat and reduced visual quality. Proper planning and consultation with experts can prevent this from happening. Before modifying your landscape, contact your local nurseryman, extension specialist, fire department or CDF.

### **10.1b Placement**

The placement of landscaping plants is a key element of a fire resistive landscape. Large trees should be located away from the house, and large shrubs should not be planted under the eaves, right next to the house. Vary the height of the landscape plants and space them so fire can't travel from one plant to another. Eliminate ladders of fuel from low-growing plants to shrubs to trees that can allow fire to spread into the crowns of nearby trees. Trees over 12 feet tall should have the branches on the lower one-third of the trunk pruned and removed. Trees over 18 feet tall should have all limbs within six feet of the ground removed. As landscaping progresses farther from the house, taller plants can be retained or planted.

### **10.1c Landscaping Zones**

Landscaping zones may protect the surrounding vegetation of damage from a home fire, but does not protect a home from wildfire. Many experts recommend a zone approach to fire-safe landscaping. Where the property is large enough, landscaping close to the house, out to 30 feet, requires irrigated, low-growing plants. The next zone, from 30-70 feet, allows medium-height shrubs and individual trees. The final zone, beyond 70 feet, allows selectively thinned brush and trees, preserving the native, natural landscape look. The distances stated here are only a general guide. Each zone landscaping approach recommends different distances. Contact your local fire department or CDF for site specific information.

### **10.1d Brush and Timber Stands**

Dense stands of brush or timber must be thinned to reduce the volume of fuel and reduce the opportunity for fire to spread from tree crown to tree crown. Separate all trees and individual brush specimens by at least 15 feet horizontally and six feet vertically. Trees should be pruned to at least six feet in height to eliminate "ladders."



### **10.1e Maintenance**

Once a fire resistive landscape is established, it must be maintained. Regularly remove dead branches, litter, needles and leaves and weeds. Keep shrubs and trees neatly pruned. In many locations, burning of debris is not allowed and hauling cut vegetation to the dump is not recommended. Consider chipping material for use as compost to improve watering efficiency. Remember to maintain an appropriate irrigation schedule that is beneficial to the plants selected. Consider drip irrigation to conserve water and reduce growth of weeds.

## **10.2 Fuel Modifications**

Global fuel modification requires two elements, identification and implementation. It is not enough to just identify those areas of extra-hazardous fuels, to delineate areas that need modification or determine where fuel breaks should be constructed to concur with development. Implementation before development occurs is the key. Once development has occurred, land ownership patterns preclude bringing hundreds of owners into a cooperative agreement. Before development begins, the only owner is the developer. Establish the agreements and begin to modify the fuels before development occurs. Locate strategic fuel breaks and secure the rights-of-way authority, establish land conservation zones and open space available for defensible space. Don't forget to ensure that maintenance of these fuel modification zones is applied on a regular basis and that funding is secured. The planning element has already been described in the Strategic Fire Planning section. The identification of a strategic plan should be included in the city or county general plan.

### **10.2a Objective**

The purposes of strategic fuel modification are to separate communities or groups of structures from the native vegetation and break up large expanses of flammable fuel into smaller blocks, all with the purpose of reducing fire loss and damage.

### **10.2b Fuel Breaks**

A fuel break is a strip or block of land on which the native vegetation has been permanently reduced and/or modified so that fires burning around it can be more readily and safely controlled. Fuel breaks are generally constructed to separate communities and clusters of communities from the native vegetation, in order to protect both the developing area and the adjacent wildlands. They are most commonly found along ridgelines where fire control efforts are focused. The most advantageous location and design must be individually determined after considering fuels, topography, weather, exposures and other constructed or planned improvements.

Fuels within fuel breaks are reduced in volume through thinning or pruning, or are changed to vegetative types which burn with a lower intensity and offer less resistance to fire control efforts. Fuel breaks are not intended to stop a rapidly moving fire, but to correct two conditions that have limited the effectiveness of fire control: the difficulty of quick, safe staffing of critical line locations when needed and the need for widening many fire breaks before they can be used effectively. Fuel breaks are not expected to control a fire in themselves, but provide points of access to facilitate control of the flanks and provide possible backfire action in the face of an advancing fire head. A fuel break system may utilize existing federal, state, county or local road systems. Most fuel breaks include roadways for vehicle access, or other continuous strips cleared to mineral soil, which serve as a barrier to the spread of fire through the fine fuels or as a line from which to backfire.

Obtaining landowner(s) approval and/or cooperation to construct a fuel break on private land can be difficult if there is no plausible benefit to the landowner. Without the landowner's approval and cooperation, the construction of a fuel break may not be feasible. If a landowner does not want to cooperate, there is generally no legal avenue to pursue. Generally a strong, effective community education program will help convince landowners of the need for cooperation. This effort can be greatly enhanced with a coordinated approach from the various entities of government that are, or will be, involved in the planning, construction and maintenance of a fuel break.



**Photograph 10.2.**  
**Fuel Break**

### **10.2c Fuel Break Construction**

A fuel break is a natural or constructed barrier used to stop or check fires or to provide a control from which to work. A fuel break is normally scraped, dug or bladed to mineral soil. The basic use and purpose of a firebreak is similar to that of a fuel break: to minimize the spread of fire from any of the included occupancies or uses to surrounding wildland areas.

The planned construction of firebreaks is no longer as common as it once was. Firebreaks are not aesthetically pleasing and can often cause serious erosion and soil stability problems. When a firebreak is the desired or required fire defense improvement, adequate environmental protection must be considered. Soil stabilization, erosion prevention measures and long-term maintenance requirements must receive thorough consideration during the planning and construction phase.

### **10.2d Greenbelts**

A greenbelt is an area of green vegetation, usually irrigated and landscaped, used as a buffer zone between developed or developing areas and wildlands. Greenbelts are designed for additional uses such as golf courses, parks and occasionally farmland. Some other greenbelts include parking lots, ball fields and other

areas that may not normally be considered to provide wildland fire prevention.

Greenbelts are similar to fuel breaks and quite often are integrated into a fuel break system. The major difference is that greenbelts are generally irrigated areas that have additional land use functions. Special consideration must be given to visual and environmental impacts during the greenbelt planning phase. Provisions for continued maintenance must also be considered. This provision may require an assessment-fee system to a homeowner's group or to an entity of local government.



**Photograph 10.3.**  
**Greenbelt and Fuel Break**

#### **10.2e Converting Fire Breaks to Fuel Breaks**

An important but often overlooked aspect of the fuel break and greenbelt planning effort is the conversion of a fire break built during the suppression of a wildfire. Often fire breaks constructed by bulldozers to halt the advance of a fire are ideally located for continual maintenance as a fuel break or even a greenbelt. Immediately after a fire of any significance, public awareness and interest is highly focused on the need to prevent similar fires. This public interest should be used to gain property owner concurrence to convert a suppression firebreak into a fuel break or greenbelt. At any rate, firebreaks should be “winterized” to prevent excess erosion during the rainy season by placement of water breaks and scattering of limbs and other woody debris across them to intercept rain.

#### **10.3 Fuels Management**

Fuel management is the planned manipulation or reduction of living or dead vegetation to prevent the ignition of wildland fires and to reduce the rate of spread and intensity of any wildfire.

Intensive fire protection provided by CDF and all fire agencies has produced contradictory results. Fire protection has been, for the most part, efficient in safeguarding natural resources, life and property. It has

also been a major contributor, however, to a gradual buildup of living and dead vegetation that, under critical burning conditions, has fed disastrous wildfires.

California's Mediterranean-type climate promotes the rapid growth of natural vegetation. Much of this vegetation dies each year and accumulates on site. Annual plants leave their total volume at the end of each growing season. Perennials renew their parts regularly and continually shed their leaves, twigs and branches. Whole plants die from old age. The result is a natural accumulation of flammable fuel that varies from one-half ton to three tons or more an acre per year.

Natural events can cause even more rapid accumulations of fuel. Drought, blowdown, snowdown, freezing and attacks from animals, insects and diseases can result in a build-up of large quantities of dead vegetation within a short time. Also contributing to the volume of dead fuels are activities such as timber harvesting, road construction and the development of subdivisions.

California's Mediterranean-type climate also discourages rapid decomposition of the dead vegetation, allowing vegetative matter to accumulate year after year. Normally this litter would be removed by nature through periodic fires started by lightning. However, wildfires are no longer permitted to remove or reduce the build-up of fuel as they did before the era of organized fire protection. Consequently, the quantity of fuel continues to increase in California's wildlands.

The inevitable result, especially during critical burning conditions, is a steady number of high-intensity conflagrations each year. These conflagrations are difficult, if not almost impossible to stop, and they often destroy thousands of acres of natural resources, hundreds of homes and other structures. Prescribed fire and controlled burns should be encouraged, under proper conditions, to assist in removing hazardous fuel accumulations and managing the remaining fuels. CDF can provide technical and professional assistance in fuels management.

In relation to this fuel management necessity, research has been conducted by the UCFPL regarding the use and disposal of accumulated fuels, termed biomass. This project is designed to identify the key issues in biomass utilization and to thoroughly describe the raw material potential of the various types of forest-based biomass materials. The results of the project will be directed towards identifying research needs, helping frame the issues at the community and state levels, and disseminating knowledge and technology. For more information on this project, go to <http://www.ucfpl.ucop.edu/biomass/woodybio.htm>.

#### **10.4 Fire Resistive Vegetation**

Fire resistive plants are generally low-growing, have a low sap or resin content, grow without accumulating quantities of dead branches, needles or leaves, are easily maintained and pruned and are preferably drought tolerant (low water users). The species may be native or ornamental. However, it has been determined that most publications on fire resistant vegetation have not relied on "actual" tests, but only on intuition or reputation. A list of fire resistive vegetation is available on the Internet at <http://www.ucfpl.ucop.edu>.

#### **10.5 Protecting and Enhancing Native Vegetation During Construction**

Many homebuilders elect to retain native vegetation as the predominant landscape plants in their yards. Native vegetation is adapted to the climate and soils and has already established itself. There is no need to wait for plants to grow into their ultimate size to see if they suit the homeowner's vision.



However, it should be recognized that human involvement or interruption of natural processes to build roads and homes could be very threatening to the health of native vegetation. Surface compaction and mechanical injury of the trunk or stem cause much of the damage. The negative effects may become evident immediately or may begin to show over time.

In addition to direct damage and injury, many construction and development activities create conditions that weaken native vegetation or that favor insects, pests and diseases. The result is additional fuels available to wildfire. An excellent reference for the builder or contractor, *Protecting Trees When Building on Forested Land* (leaflet 21348), is available through the University of California, Cooperative Extension. General considerations include:

- Reducing the density of trees so that those remaining will have sufficient light, moisture and nutrients.
- Removing trees that are close to or that will interfere with proposed roads, foundations, septic systems, driveways and utility corridors.
- Selecting remaining trees for health and vigor, aesthetics and the ability to provide appropriate shade and visual and wind screening.
- Avoiding trees that will require roof modifications or decks to be built around them, that are most likely to be damaged during construction and that will have their health compromised due to site changes such as moisture and soil level.
- Maintaining a mixture of ages; allowing older trees to be replaced by younger, healthier trees.
- A tree that is the right size now may be too big in a few years -- plan ahead.
- Select native vegetation that has good vigor. A local nursery and forester can assist in identifying the correct trees and shrubs to keep.
- Fence around trees and shrubs at the drip-line to avoid damage by construction activity and equipment.
- Minimize grading and soil movement.
- Utility trenches should be kept away from "keeper" trees. Tunnel if activities must encroach in their root zone.
- Do not backfill or change the grade immediately around trees. Build a stone or concrete well to protect the original grade around the tree.
- Asphalt and other hard surfaces can prevent or significantly reduce the amount of water reaching the roots of a "keeper" tree.
- DO NOT attach utility wires or lines to trees.
- Frequent watering of lawns and flowerbeds can damage the sensitive root systems of native species.

## **10.6 Urban Forestry**

It may seem strange to see the term urban combined with the practice of forestry. Yet, the urban exodus and rural community growth in California have brought with them many urban environment problems and have created many new ones. Many communities in rural California are now landscaped with urban forests. Urban and formal landscape vegetation is mixed with rural and native plants, and all are intermixed with homes and businesses. Failure to deal with the problems associated with rural growth may create a landscape that is unhealthy, dying, lacks vigor and is aesthetically unpleasant. In addition, conditions may foster and promote an increased fire hazard.



## **10.7 Project Learning Tree**

Education is needed to increase awareness, knowledge, and critical and creative thinking skills. The California Project Learning Tree (PLT) program is part of an international network of parents, educators, resource professionals, members of community and environmental groups, and the forest products industry.

PLT provides educators, working with children in grade preK-12, with an effective environmental education program that uses the forest as a “window” into the natural and built world. In California, PLT is sponsored by CDF and is managed by one State Coordinator and a cadre of volunteer facilitators, supporters and a statewide advisory committee. For more information visit their website at

<http://www.plt.org>.

## **10.8 Weed Abatement Ordinances**

The maintenance of defensible space around the home is as important as a fire resistive roof in protecting a home from wildfire. The state law for clearance of flammable vegetation was discussed in an earlier chapter. Many local jurisdictions also require clearance of flammable vegetation. In a community setting, this may take the form of clearance of vacant lots within a subdivision. In a more rural setting, this may be similar to the state clearance law, though most local jurisdictions require clearance well beyond the 30 feet required by state law. In either case, if a landowner fails to provide the required clearance, the jurisdiction has a contractor clear the lot or property and bills the property owner. Failure to pay the bill enables the placement of a lien on the title of the property. You should contact your local fire department for further information. An excellent example of a weed abatement ordinance is the [\*Riverside County, Idyllwild Weed Abatement Ordinance\*](#).

## **11. EXISTING BUILDINGS AND STRUCTURES**

Obviously, existing buildings and structures are exempt from most new fire safety requirements. It is extremely expensive to upgrade several miles of road when building a single house. Yet, when a new subdivision is proposed at the end of an existing road, the jurisdiction may require upgrading the entire road under CEQA, based upon a public safety need. Yet, in the majority of cases, once it is built, it does not have to change.

There are exceptions, however, including the requirement that if more than 50 percent of a roof covering is replaced within a year, the entire roof must be replaced with the appropriate roof covering required within that particular zone. Many local jurisdictions require some retroactive application when triggered by a major remodel or specific life safety activity. Any homeowner who is remodeling should be encouraged to adopt reasonable fire safe standards as reconstruction occurs.

Efforts to gather homeowner support to upgrade roads and other infrastructure may be approached through a local homeowners' association or road improvement district. Individual adoption of defensible space can be triggered through direct application of multi-media fire safety programs and peer pressure. Demonstration activities and "how-to" presentations can convince many that the cost is minimal and the gains are significant. Neighborhood or block clean-up parties can stimulate interest and motivate large numbers of people to get involved and protect themselves.

Fuel and vegetation modification practices discussed in an earlier chapter are readily available for individual as well as community or neighborhood protection. Using roads and perimeter areas surrounding a neighborhood, minor fuel modification may be enough to establish a reasonable defensible space.

Information relative to the Bates Bill, State Fire Marshal "Model Ordinance for Defensibility of Space and Structures," and the Brown Bill is included as Appendices G, H, and I, respectively. Extensive information on these items is also available in the *Wildland Fire Hazard Assessment* report, which can be found at <http://www.prefire.ucfpl.ucop.edu/izhazard.htm>.